the cartridge before the assay is complete and the results reported. This mechanism can be located on any part of the external housing (top, bottom, sides).

[0252] In some embodiments, as outlined herein, the bays can include sensors to monitor and control thermal zone temperatures (e.g., thermocouples, resistance temperature detectors, etc.).

[0253] The bays may comprise individual fan filters or a manifold with a single fan filter to keep dust and debris from the system, and can also include bay cooling fans in each bay compartment to help, with the aid of the individual bay heating elements to keep the bays and thus the assay at uniform temperature throughout a run.

[0254] The bays generally comprise a bay PCB to power, monitor, and control the bay, LRM, and the cartridge in general.

The Base Station

[0255] The base station of the instrument comprises a number of components, including a central processing unit that allows independent bay controllers and electric and network connections to each tower, an optional identification tag reading device as described herein, (e.g., a hand-held bar code scanner) and a touch screen user interface with individual icons corresponding to each bay.

[0256] The systems of the invention include at least one processor, and in many cases, as described herein, each bay of a bank has its own individual processor. The devices also include memory and at least one program stored in the memory and executable by the processor, comprising instructions to execute the assays (including the manipulation of droplets, reagents, blister ruptures, and detection programs) of the invention.

[0257] In some embodiments, each bay is independently controlled and processed. That is, after scanning a patient or sample barcode, the operator can choose to put the cartridge into any bay, in no particular order, and start the assay, independently of any other cartridge/bay combination and/or status. That is, the bays allow optional random and optional continuous access, such that a bank need not be run at the same time, and cartridges can be inserted into a bay at any time after they are loaded with sample.

[0258] The bays each include a processor with memory with at least one program stored in the memory and executable by the processor comprising instructions for steps of the assay including, but not limited to, blister package actuators, heating programs, electrowetting transport steps, mixing steps, magnetic bead capture steps, washing steps, detection steps, reporting steps, exporting data steps, etc.

[0259] In some embodiments, the bays optionally include EPROM readers to allow reading the EPROMs on the individual cartridges as discussed below, such that some or all of the executable step program is stored on the EPROM and not on the bay processor.

[0260] In addition to the processors for bay control, in general the devices have a processor, memory and executable programs to allow the creation and maintenance of operator profiles, such as log-in information, preferences, etc. In addition, one program that is optionally included allows the association of the assay reports to be tied to the operator who loaded the sample, and not the operator who unloads the cartridge. That is, one operator does not need to log off for a second one to log into any particular device.

[0261] The base station can also include technology to allow remote access, remote control, and remote servicing, such as that sold and distributed by Axeda technology (available at the Axeda website).

[0262] In a preferred embodiment, the base station comprises an identification tag reading component to allow identification and correlation of the patient sample to a result. In some embodiments, this identification tag reader is a barcode reader to read a corresponding barcode on the cartridge. The barcode reader can be a hand held scanner, which can be attached to the base station by use of a processor port, such as a USB port. Alternatively, the base station itself can be configured to contain a barcode reader, for example at the bottom of the base station, where the user can slide the cartridge under the station for reading. As outlined herein, these barcodes may be used for a wide variety of purposes, including, but not limited to, identifying the sample (e.g. patient number or code), the test being done, the batch number of the chip, calibration information, assay protocols including cycle time, signal processing requirements, etc.

[0263] In addition, in some embodiments the barcodes can be used to control the instrument. For example, instrument control may be through the use of a keyboard, a mouse or a barcode reader. Thus, for example, there may be barcodes on the cartridges to indicate the identity of the chip, but also on a card to scan for starting the assay, stopping the assay, downloading the data, etc. Thus for example a user would scan the cartridge prior to insertion into a bay, and then scan a barcode to start the assay protocol. In a preferred embodiment, the card of barcode commands are found in a drawer or storage compartment of the device, outlined herein.

[0264] In general, the base station includes a common electric and network hub to simplify cabling and tower connection to the base station.

User Interface

[0265] The devices of the invention further have at least one touch screen display having a plurality of bay icons, each icon uniquely corresponding to one of said plurality of bays. As shown in the figures, the bay icons share a one to one correspondence, including a spatial correspondence, with the biochip cartridge bays where the cartridges are inserted. That is, the upper left hand bay icon corresponds to the upper left hand bay, etc. Thus, depending on whether 1, 2, 3 or 4 banks of 6 bays are used, the touch screen display will have 6, 12, 18 or 24 bay icons, arranged by column and row in the same fashion as the bays.

[0266] The system optionally uses a launch pad interface that is icon-centric in order to support globalization, e.g. to avoid translation of general operating parameters into multiple languages.

[0267] In one embodiment, the insertion of a biochip cartridge into one of the bays causes the corresponding bay icon to be enlarged and/or exhibited, generally causing a panel of options to be exhibited. In general, the panel of options is a plurality of secondary icons that allow different data about the bay and the inserted chip to be shown. Thus, for example, the secondary icons include, but are not limited to, an icon to review biochip cartridge data or report, an icon for status of a biochip cartridge assay, an icon depicting the time remaining in a biochip cartridge assay (for example, as a clock face that when pressed shows a time bar that changes fill color as a result of assay progress); an icon to generate a data report of biochip cartridge data; an icon to print a data report of biochip